

DISCOPLANA TAKEWAKII SP. NOV., A POLYCLAD PARASITIC
IN THE GENITAL BURSA OF THE OPHIURAN

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ONE PLATE AND TWO TEXTFIGURES

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Through the suggestion of Mr. Kiyoshi Takewaki of the Zoological Institute, Tokyo Imperial University, the present study was undertaken on a polyclad, infesting the genital bursa of *Ophioplocus japonicus*, a common ophiuran occurring between tide-marks along the Pacific coasts of Japan. In general appearance, this parasitic planarian fairly resembles *Stylochoplana* or *Leptoplana*. However, judging from the absolute lack of the prostate gland and some feature of the genital organs, it represents a new species referable to *Discoplana*, established by Sixten Bock in 1913, and the writer proposes to call this planarian *Discoplana takewakii* sp. nov.

Under the genus *Discoplana*, the following four species have hitherto been recorded: *D. pacificola* from the west coasts of South America; *D. subviridis* from East Africa, the Indian and Pacific Oceans; *D. malayana* from Malay Islands; *D. concolor* from East Africa. They were all reported as free living animals except one case, in which Bock (1925) observed *D. subviridis* living among branches of Madreporarians on the Bonin and Gilbert Islands in the Pacific.

In looking over 200 specimens of *Ophioplocus japonicus*, collected in the neighborhood of the Mitsui Institute of Marine Biology during the spring and summer of 1934, the present writer came across 20 specimens infested by planarians. In one bursa was observed a single worm which folded into two by turning its ventral surface to the outside and often stretched so highly that the thin membrane of the sack seemed to burst open. However, no animal was observed living in the body cavity out of the bursa. It is without doubt that the

animal feeds on gonads attached to the bursa, since no germ cells were found on the infested bursa.

During summer, the animal deposits eggs in the genital bursa of the host. The cocoon is irregular in shape and a light brownish color. It measures about 4 mm in length and 2 mm in width, containing some 1,000 eggs.

The body is elongated oval in shape, thin and delicate, strongly flexible and the margin slightly frilled, without tentacles. The measurements of a large specimen are as follows:

Total length	11 mm
Total breadth	6 mm
Tentacular eye-spots from the anterior end	2 mm, 0.5 mm apart
Mouth opening from the anterior end	3 mm
Male genital pore	about the middle of the body
Female genital pore from the male	2.2 mm
Female genital pore from the hind end	3.2 mm

The ground color of the body is milky white, semi-translucent, but the animal presents light-brown color owing to the presence of pigment granules in the epithelium of the finely branched intestine. The tentacular eye-spots, 2-10 in number, are loosely grouped at about one-fifth the body length from the anterior end. The cerebral eye-spots are irregularly scattered on both sides above the brain, 5-15 in number. There are no marginal eye-spots.

The epidermis is made up of ciliated columnar cells, much higher on the dorsal than on the ventral side, and contains a number of minute rhabdites. The basement membrane is very thin. The dermal musculature is poorly developed, consisting of only three thin muscle layers, the external longitudinal, the middle diagonal and the innermost circular. Owing to the undeveloped musculature, the movement of this planarian was very sluggish when it was transferred outside the host. The rapid, smooth gliding which is a usual mode of locomotion in polyclads was not observed. It glides slowly with the frontal part of the body by the undulation of its hinder part.

At a distance between one-third and one-fourth of the body length from the anterior end and slightly in front of the middle of the pharynx occurs the mouth which leads into the pharyngeal chamber with the plicated pharynx of a length about one-fifth that of the body. The pharynx is simply cylindrical and provides no folding. A rather wide main intestine runs along the median line, giving rise to 5 pairs of

main lateral branches, each of which is irregularly subdivided near the body margin, without showing any anastomosis.

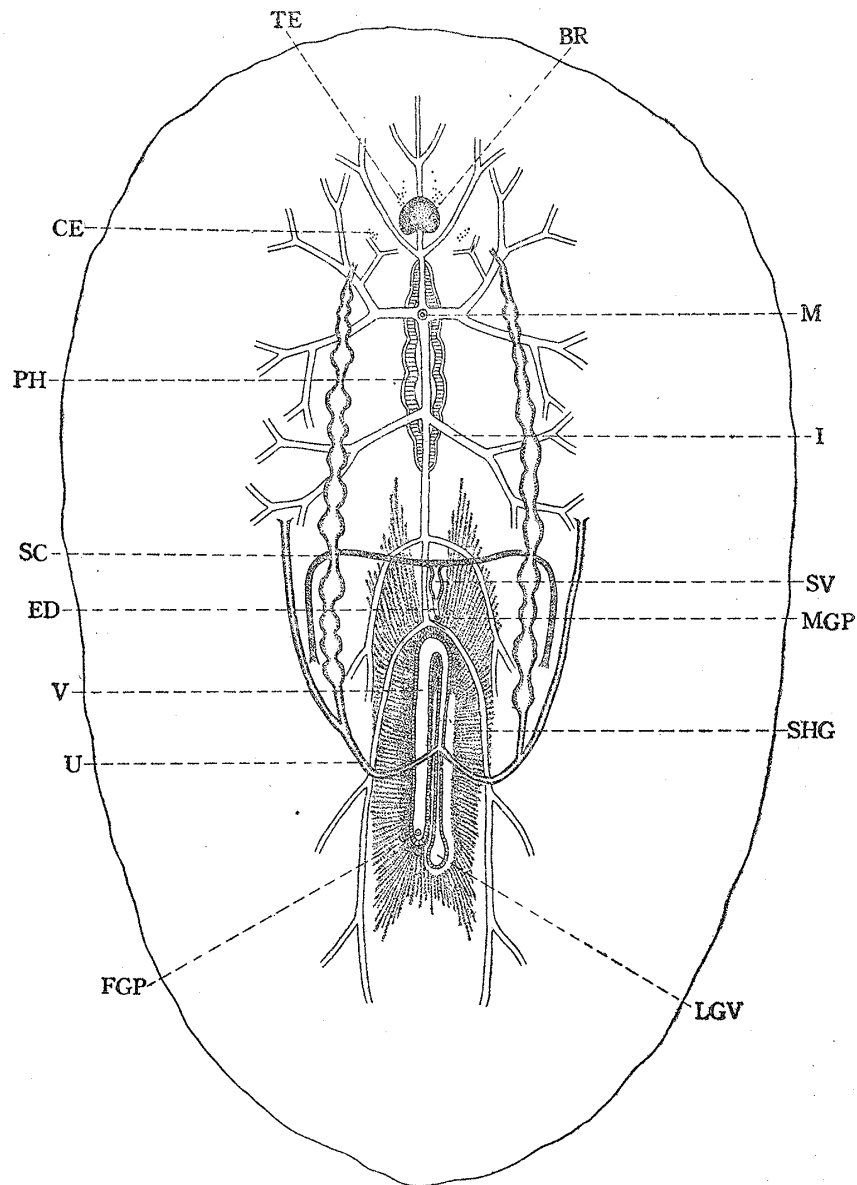


Fig. 1. *Discoplana takewakii* sp. nov., $\times 20$. BR brain, CE cerebral eye-spots, ED ejaculatory duct, EGP female genital pore, I intestine, LGV Lang's glandular vesicle, M mouth, MGP male genital pore, PH pharynx, SC seminal canal, SHG shell gland, SV seminal vesicle, TE tentacular eye-spots, U uterus, V vagina.

A small number of testes are found scattered in the ventral part. The seminal canal, one on each side, can be traced first from the level of the middle point between two genital pores. At this beginning part

the canal terminates in a funnel-like opening and it proceeds forwards for a short distance, then turns in an approximately right angle towards the body axis, where it unites with the corresponding canal of the other side by means of a single seminal vesicle which is provided with a muscular wall and outer nucleated zone. The vesicle represents a gourd-like shape when filled with spermatozoa, while in vacant state it is seen only as a twisted tube with a thicker muscular wall. The vesicle passes backwards into the narrow ejaculatory duct with rather thick muscular coating, which opens, after taking a wavy course, at the tip of the small conical penis. The penis is protrusible and in resting state subvertically disposed in the upper part of the narrow antrum masculinum which opens to the exterior by the minute genital pore at about middle of the body. The penis has no stylet, but a pair of very small chitinous spines exist in the ejaculatory duct.

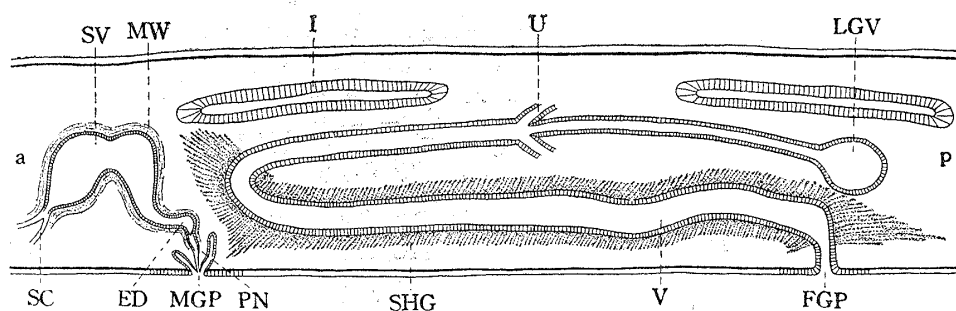


Fig. 2. Genital organs of *D. takewakii* in sagittal section. $\times 50$. a anterior, p posterior, PN penis. Other letters as in Fig. 1.

The total lack of a real prostate vesicle is the main feature of this genus, but the existence of the extracapsular gland and the special glandular nature of several parts of the male genital organs, have been recorded in several *Discoiplana* species. Plehn (1896 a) observed the glandular nature in the seminal canal of *D. pacificola* in spite of the lack of the prostate gland. Afterwards, she observed (1896 c) in *D. subviridis* the extracapsular cells around the whole length of the male genital organs and said: "Wie bereits erwähnt, fehlt eine gesonderte Körnerdrüsenblase; dagegen ist ganze Umgebung des männlichen Apparates von grossen birnförmigen Drüsenzellen erfüllt, die zweifellos extracapsulären Körnerdrüsen gleichzusetzen sind." Bock (1913) also observed the same characteristic on his specimen of *D. subviridis*. On the contrary, Meixner (1907 b) did not observe it on his specimen of the same species, but the "Körnerdrüsenepithel" on the

distal part of the epithelium of the antrum masculinum. In the present species also, numerous pear-shaped extracapsular glands have been observed surrounding the whole length of the male genital organs. They are much crowded surrounding the seminal vesicle and the funnel-like terminal part of the seminal canal. Both the seminal canal and the seminal vesicle are usually filled with spermatozoa and eosinophilous secretions of the extracapsular glands.

In contrast to the simple structure of the male genital organs, the female organs develop well on the whole. The female genital pore is situated at one-fourth the body length from the posterior end and apart from the male by a long distance. The antrum is very narrow and passes anteriorly into the highly developed wide vagina lined with cubical ciliated cells. The vagina proceeds forward to a point near the level of the penis and turns abruptly backwards. Surrounding the vagina, from the genital pore to near the turn, an immense mass of finely granular, eosinophilous shell gland secretions are gathered, the gland cells of which are situated on both the dorsal and ventral parenchyma under the muscularis rather widely apart from the vagina. After the turn, the vagina narrows slightly and runs for a short distance to meet the paired uteri from both sides and a median narrow canal of Lang's glandular vesicle or accessory vesicle situated above the female genital pore. The vesicle is small and spherical in shape, provided with a muscle wall. It is lined with glandular cubical cells and usually contains a mass of spermatozoa and other secretions.

About the uteri, some resemblance could be observed between this species and *D. subviridis* according to the observation by Laidlaw (1902). He says: "firstly there is a duct-like part, consisting of a narrow tube lined with cubical ciliated epithelium, surrounded by a few circular muscles. This opens at about the level of the male aperture into a wide, irregular part, the pair extending forward on either side of the pharynx, and in one of the specimens, examined by section, containing eggs. The walls of this glandular part are much folded, and their epithelium is secreting actually and full of globules of a finely granular substance. Cell outlines are not visible." In the present species, each uterus takes a downward-oblique course for a short distance and turns forwards. Near the turning point it divides into two canals. The outer one is very narrow, covered with the flat epithelium and proceeds to a point near the level of the male genital pore to terminate with a funnel-like opening. The inner pair soon expands enormously into saccular canal provided with numerous side

pockets. The two canals go as far as the brain region but never communicate with each other. This saccular part of the uterus is covered with cubical glandular epithelium and usually contains a large mass of eggs. In some cases, however, it contains a mass of spermatozoa in addition to the eggs and in several specimens only the former instead of eggs, in which latter case the sperm-heads are all directed anteriorly. The existence of spermatozoa in the uterus is a noteworthy fact and has been recorded only in *Polyposthia similis* of the group Craspedommata by Bock (1913). It is without doubt that the sperms were attracted by chemotaxis to the secretion of the uterine epithelium to run so far as the end of the uterus in the brain region and to fertilise the eggs in the uterus. The ovaries are scattered chiefly in the dorsal part of the body.

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EXPLANATION OF PLATE 10

Fig. 1. *Discoplana takewakii* sp. nov. $\times 13$.

Fig. 2. Cocoon. $\times 15$.

Fig. 3. Part of a tangential section demonstrating the uterus containing eggs and sperms. $\times 75$.

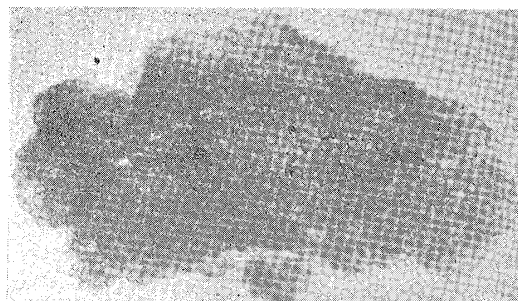
Fig. 4 and 5. Longitudinal sections through the genital organs. $\times 75$.

ABBREVIATIONS

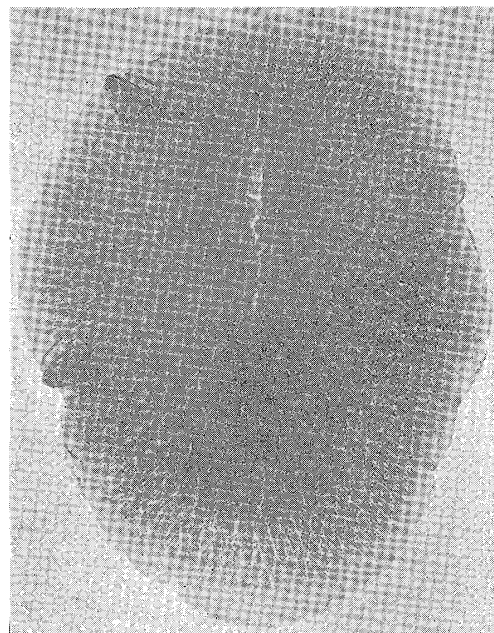
eg egg, *ep* epidermis, *i* intestine, *lgv* Lang's glandular vesicle, *pn* penis, *sc* seminal canal, *sn* spine in the ejaculatory duct, *sp* sperm, *shg* shell gland, *sv* seminal vesicle, *u* uterus, *v* vagina, ♂ male genital pore, ♀ female genital pore.

DISCOPLANA TAKEWAKII SP. NOV.
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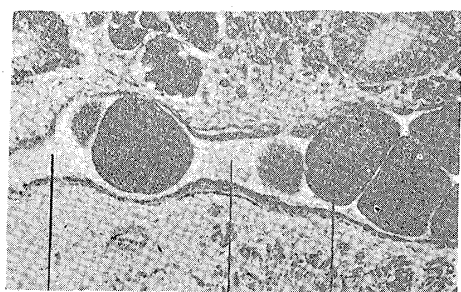
PLATE 10



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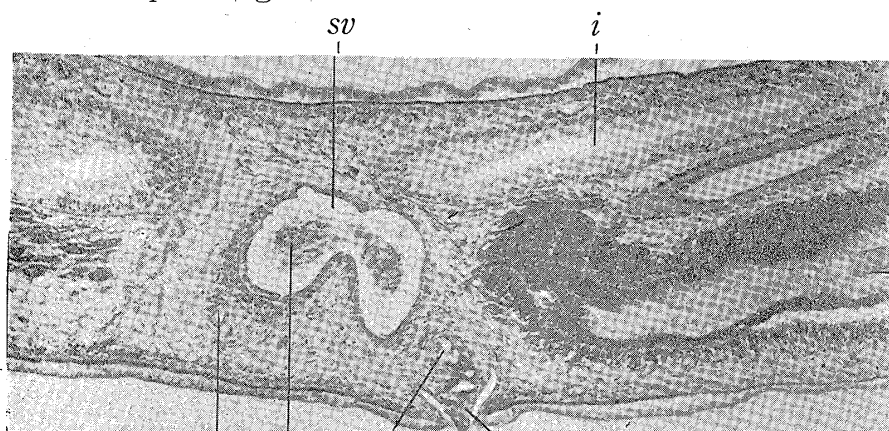


1



3

u *sp* *eg*

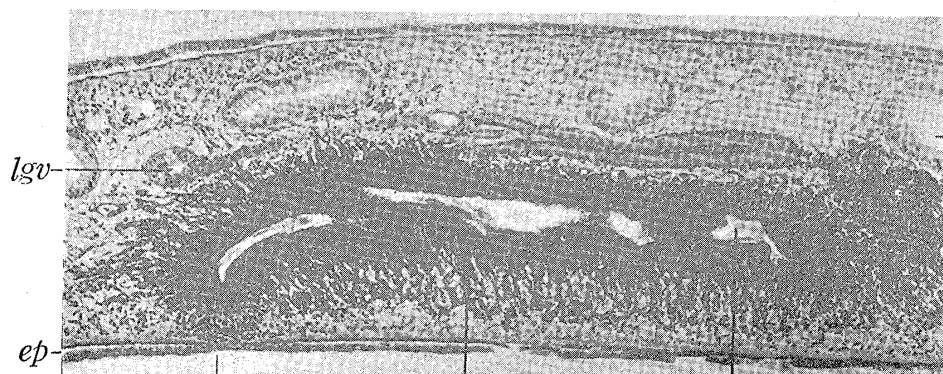


shg

v

4

sc *sp* *sn* ♂ *pn*



lgv

i

ep

♀

shg

v

5